Understanding how the body's central nervous system does the locomotion

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Spinal cord motor neurones, which control our muscles, have complex properties that ensure they work properly. These motoneurones degenerate in diseases such as amyotrophic lateral sclerosis (ALS). Dr. Robert Brownstone is researching motoneurones to better understand their properties and to design strategies aimed at treating spinal cord injuries and disease.

Dr. Brownstone's objective is to determine how the body's central nervous system produces movement such as locomotion. Motoneurones accept synaptic input from many sources, integrate this input, and produce output, to ensure the appropriate contraction of muscles. Understanding how the input to motoneurones can be turned into a specific, effective output is an essential step in understanding control of movement. This research, using laboratory mice, will help determine how spinal cord motoneurones function and how the active properties of the many dendrites, or processes, of these neurones contribute to their function.

Electrical activity is produced in neurons by the movement of ions through channels in the cell membrane. There are many membrane currents involved in motoneurone activity. Dr. Brownstone is investigating the role of various calcium and potassium currents. The primary objective of his current study is to determine the effect of two modulators important in the production of motor activity – serotonin and acetylocholine – on these currents.

The results of Dr. Brownstone's research will lead to an understanding of the channels important in regulating the input-output properties of motoneurones. "In addition," he says, "we will understand how the modulation of these currents can lead to the repetitive firing behaviour seen in motoneurones during a motor behaviour in the intact spinal cord, such that effective motor output is produced."

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Research Results